

'*Placopsilina*' *cenomana* d'Orbigny from France and England and the type species of *Placopsilina* d'Orbigny, 1850 (Foraminiferida)

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SYNOPSIS. English *Placopsilina* /*Lituola cenomana* specimens in the British Museum (Natural History) are closely similar morphologically to material collected from the Upper Cretaceous type area of Le Mans, France. The French material, however, has a randomly arranged, coarsely agglutinated solid wall structure, whereas the English specimens from the Chalk show a radial alignment of calcitic grains; the latter are therefore re-assigned to '*Placopsilina*' *northfleetensis* sp. nov. We at present depend for generic information on d'Orbigny's descriptions of *P. cenomana* and *cornueliana* d'Orbigny, although the poorly diagnosed species *scorpionis* is the type of *Placopsilina* d'Orbigny (1850a) by monotypy; Cushman (1920) was in error in designating *cenomana* d'Orbigny (1850b) as type. The name '*Placopsilina*' is therefore used in quotes.

INTRODUCTION

Housed in the Micropalaeontology section of the British Museum (Natural History), London are numerous specimens, presented by various collectors, of an adnate agglutinating foraminifer, labelled *Placopsilina* or *Lituola cenomana* d'Orbigny, from English Cretaceous localities. Their assignment to *cenomana* follows Carpenter *et al.* (1862: 143; pl. XI, figs 11-14), who no doubt considered their specimens conspecific with those described, but not figured, by d'Orbigny (1850b) from Le Mans, France. I have attempted to verify that the English material is the same as that from the type area of *cenomana*, and to address the possibility that *cenomana* is synonymous with *Placopsilina cornueliana*, described by d'Orbigny in the same paper. But the problem of generic placement has not been overcome (see below); all references here to the genus, other than to those by d'Orbigny, are thus in inverted commas.

Cushman's (1920) designation of *P. cenomana* d'Orbigny (1850b) as type species is incorrect. He was unaware, possibly because of the confusion over publication dates (Sherborn 1922), that *Placopsilina scorpionis* d'Orbigny (1850a) was the genotype, by monotypy. This species, to my knowledge, has never been properly investigated and because type material is unavailable cannot be investigated here. The diagnosis of the genus thus still depends upon the interpretation of the descriptions of *cenomana* and *cornueliana* by Reuss (1862), and also by Carpenter (1862). D'Orbigny paid no attention to wall composition, so it is possible that on investigation the wall of *scorpionis* will be found not to be agglutinating. In that case both *cenomana* and *cornueliana* as now interpreted would be referred to a new or existing genus other than *Placopsilina*, but any attempt to do so here is considered premature. Additionally, no syntypes of either *cenomana* or *cornueliana* have been found and the designation of neotypes from other material, because of the incompleteness of our knowledge, is inadvisable at present.

THE TAXONOMIC BACKGROUND

The first published reference to *Placopsilina* made by d'Orbigny was in the first volume of the *Prodrome* (1850a: 259), when he included it in his 9th stage, Toarcian, among the foraminifera:

'**PLACOPSILINA**, d'Orb., 1847. Ce sont des *Wibbina* [*sic*] à locules pleines.

*283. **scorpionis**, Espèce très-rugueuse et très-diversement contournée. France, Saint-Maixent (Deux-Sèvres).' (The Département of Deux-Sèvres is in western France.)

No illustration was given. The date 1847 was the year in which d'Orbigny completed the manuscript of this first volume, but its expected publication date of 1848 was delayed by a revolution in that year, so that the printed version could not appear before 1849 (d'Orbigny 1850a: lxi; Heron-Allen 1917: 61). Some of the printed copies of the first volume did in fact bear the date 1849 on their title-pages, but it was not published until January 1850 (1850a) and the remaining copies were revised to bear the name of this new year; a copy was presented by d'Orbigny to the Société Géologique de France, Paris, on January 21st 1850 (Sherborn 1922: xcviij).

In January, 1850, therefore, the genus *Placopsilina* was first published and it was monotypic, only the Toarcian species *P. scorpionis* being included. By ICZN (1985) Art. 68d, *P. scorpionis* must be the type species of the genus *Placopsilina* by original monotypy. The second volume of the *Prodrome* (1850b), containing *P. cenomana*, was not published until November 1850.

Cushman (1920: 70) subsequently designated *P. cenomana* as the type species of *Placopsilina*, during his studies on the Lituolidae. His selection of *P. cenomana* had not previously been seen to be erroneous probably because some of the copies of Vol. 1 of the *Prodrome*, as explained above, had their imprinted publication date revised to 1850, the same year as that imprinted on the title page of Vol. 2; the assumption was commonly (but erroneously) made that the two volumes had been published at the same time. In fact, the



Fig. 1 *Placopsilina cornueliana* d'Orbigny 1850b. Reproduction of Cornuel's figure (1848: pl. 2, fig. 36). Recorded in the plate explanation as 'Oeufs de Mollusques', the left hand illustration ('à gauche') was selected by d'Orbigny as the type figure of his new species; $\times 15$.

second volume was not published until November 1850 (Sherborn 1922: xcvi). It is unfortunate that the name *cenomana* has been so widely cited while *scorpionis* remains virtually unknown.

In 1850b (November) d'Orbigny [p. 96], wrote of *Placopsilina*, 'Ce genre ressemble aux *Truncatulina*, mais est toujours fixe, et n'a d'ouverture qu'à la partie supérieure de la dernière loge'. Finally in 1852 [p. 119], he emended the diagnosis further, writing . . . 'C'est une *Truncatulina*, tout à fait fixée par la coquille, souvent projectée en crosse, dont l'ouverture occupe seulement la dernière loge'. Between 1850 and 1852 he erected the species *scorpionis*, *neocomiensis*, *cenomana* and *cornueliana* and placed them within *Placopsilina*, but only *cenomana*, to which our English specimens have been referred, and *cornueliana* are of concern here.

D'Orbigny (1850b) introduced the name *cornueliana* (No. 791) for a species from Vassy, which he considered synonymous with a specimen figured by Cornuel (1848: pl. 2, fig. 36, the left hand figure only) from Saint-Dizier (Haute Marne, north-east France), and referred to by the latter as 'Oeufs de Mollusques' (reproduced here, Fig. 1). This is the first illustration of a *Placopsilina*, but there was no accompanying description by Cornuel, except a mention of its size.

In 1862, both Reuss and Carpenter *et al.* independently added further interpretations to the diagnosis of the genus. Reuss (1862: 383) placed *Placopsilina* under *Nubecularia* Defrance (within the Lituolidea), thus implying that he considered d'Orbigny's genus to be a member of his group

'mit Sandig-Kieseliger schale'. Carpenter (1862: 143; pl. 11, figs 11–14) considered that *Placopsilina* (typified by *P. cenomana*) should be placed within 'Genus *H.—LITUOLA*' . . . as having a 'test composed of an aggregation of particles obtained from external sources, the organic cement by which these particles are united being all that is furnished by the animal' (1862: 140).

Rhumbler (1913) placed *Placopsilina* in his new subfamily, the Placopsilinae. This was raised to family level by Cushman (1927: 41), who diagnosed it as having 'chambers simple, not labyrinthic'. This suprageneric assignment was retained by Loeblich & Tappan (1964, 1988), who defined the subfamily thus: 'Test attached; early stage coiled or arcuate, later uncoiled; wall agglutinated, solid'.

As recognition of the true identity of the type species, *P. scorpionis*, is beyond the scope of this paper, and, as I shall show, the definition of *Placopsilina* in terms of the wall structure needs further investigation, the generic assignment of my material is given as '*Placopsilina*' throughout the ensuing text to indicate that a thorough revision of the genus is very necessary.

THE FRENCH SPECIES

As we have seen, d'Orbigny erected in January 1850 (1850a) the new genus *Placopsilina* and a single new species (*P. scorpionis*) which, by monotypy, must be the type species, although the description, given above, was unsupported by illustration. The syntypes, which were his own specimens (marked *, see description, p. 1) have not been found in the d'Orbigny Collection in Paris (Vénez-Peyré, personal communication). No neotype has been designated, since the determinations supplied by Terquem (1866) of non-topotypic specimens from the Upper Lias of either the Départements de la Côte d'Or (eastern France) or de l'Indre (west-central France) have yet to be verified as conspecific (see original page in the Ellis & Messina *Catalogue of Foraminifera*, 1940). Until such time as Terquem's topotypes are found, or a neotype is designated, the true nature of *Placopsilina* will not be known.

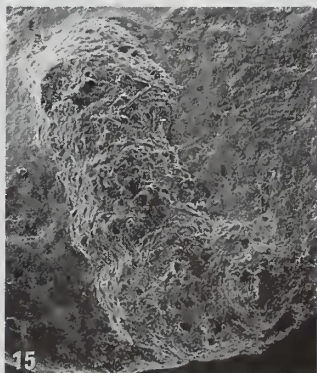
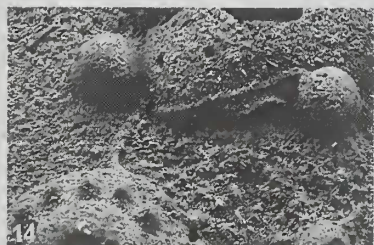
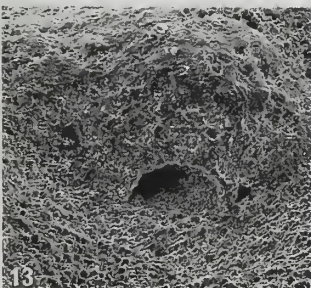
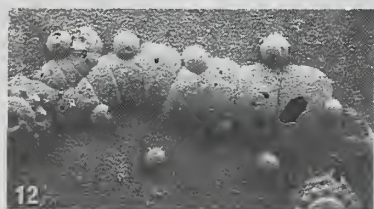
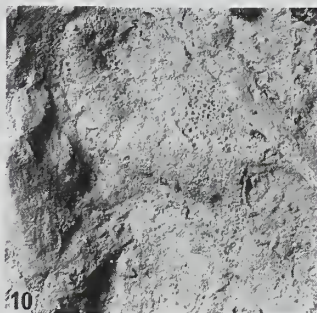
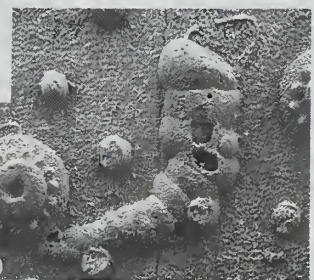
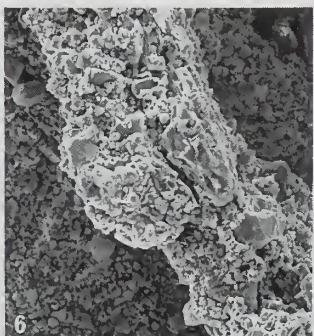
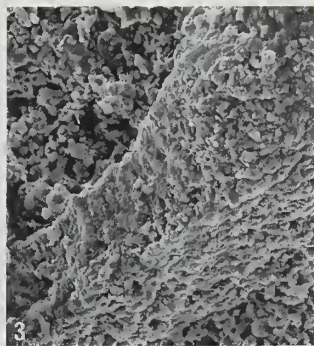
D'Orbigny erected two new species in November 1850 (1850b), *Placopsilina cornueliana* and *P. cenomana*.

Of *Placopsilina cornueliana* d'Orbigny (1850b: 111) no description was given, but it does not exceed 2 mm in length. The species was thought to be conspecific with the 'Oeufs de mollusques' mentioned and figured by Cornuel (1848: 259;

Figs 2, 5–8, 10, 13, 15 '*Placopsilina*' *cenomana* d'Orbigny. Examples of specimens from three localities in the Le Mans area (Sarthe), France. (For localities, see section on material studied, p. 4). Figs 2, 5–7, 10, 13, loc. 1. Fig. 2, P52773, poorly preserved specimens showing both crosier and nodosarid early chamber arrangement, $\times 30$. Fig. 5, P52774, immature truncatuline forms, $\times 15$. Fig. 6, P52776, portion of a fractured wall from specimen illustrated in Fig. 7, containing large randomly arranged angular grains, $\times 400$. Fig. 7, P52776, illustrating meandriform method of growth and empty chambers, $\times 20$. Fig. 8, P52777 (loc. 3), partially overgrown with bryozoa, $\times 20$. Fig. 10, P52775, with well preserved truncatuline coil, $\times 13$. Fig. 13, an intercameral aperture (specimen illustrated not identified). Fig. 15, P52778 (loc. 2), coarsely agglutinated form with crosier-shaped initial stage, $\times 27$.

Figs 3–4, 9, 11–12, 14 '*Placopsilina*' *northfleetensis* sp. nov. Examples of English specimens attached to echinoid fragments from loc. 4 (see p. 4). Fig. 3, P40816(2), portion of a fractured wall from specimen illustrated in Fig. 4, showing radial arrangement of calcitic microgranules, $\times 600$. Fig. 4, P40816(2), incomplete specimen following contour of substratum (see Fig. 3), $\times 41$. Fig. 9, Paratype P40852(2) (see also Fig. 24), $\times 30$. Fig. 11, P40818, showing the empty chambers, $\times 25$. Figs 12, 14, **Holotype** P40852(1) (see also Fig. 32), Fig. 12 showing initial coil, followed by crosier and later rectilinear growth; note also position of the terminal basal aperture, $\times 23$; Fig. 14 close-up of intercameral aperture, $\times 60$.

Scanning electron micrographs. Figs 2, 5, 8–12, 14 are uncoated and were studied using back scattered electrons in an environmental chamber. (The scanning electron microscopes used were the ISI 60A and ISI ABT 55 models).



pl. 2, fig. 36, the left hand figure only), and here reproduced as Fig. 1. It was recorded as occurring in the 17e Étage : Neocomien, marne calcaire bleue, at Saint Dizier. In a personal communication, Marc Barbier, the Saint Dizier Museum curator, expressed a hope that when curation was completed, these specimens might be found.

Placopsilina cenomana d'Orbigny (1850b: 185) was described merely as an 'Espèce contournée en crosse adhérente aux corps'; it was not figured. It was recorded from the 20e Étage : Cenomanien, at Le Mans (Sarthe). D'Orbigny indicated by a * that the specimen was his own (1850a: lv), which leads me to assume that it may still be present, unrecognized, somewhere within a d'Orbigny collection, although it cannot be found in the Muséum National d'Histoire Naturelle, Paris (Véneq Peyré, personal communication). It is unwise therefore to designate a neotype.

Although the failure, at present, to find syntypes of either of the above species hampers proper taxonomy, by using known facts it is possible to build up a picture of a genus and species which, when applied to material from the type area, can provide significant information. First, from Cornuel's figure, the shape, size and form of '*Placopsilina*' can be deduced. Secondly, for *cenomana* there is a brief description (see above). A broad picture of '*Placopsilina*' can thus be drawn from d'Orbigny's descriptions.

It can be *Truncatulina*-like in shape, or with a coil of many chambers sometimes laid down in a crosier-like configuration and extended in a rectilinear manner, all parts being fixed to the substrate with an aperture on the superior part of the last chamber. The length is up to 2 mm.

About the wall structure there is no information, however. D'Orbigny observed that *Placopsilina* was '*Wibbina*-like' in form. (Probably he meant *Webbina*-like, for I cannot find the term *Wibbina* used in any context). Although the fixed inequilateral form of these two genera was similar (see Le Calvez, 1974, for information on *Webbina rugosa*, the type species of *Webbina*) there must have been some fundamental difference observed by him in separating them. I can only speculate that the placopsilinids were more truncatuline, rather than nodosarid, in form in some specimens, and that the composition of the test was unusual; the latter, however, d'Orbigny did not consider important. Reuss (1862) and Carpenter (1862) were left to speculate on its agglutinating nature, since there is no indication that either had any contact with d'Orbigny and there is no information from publications that they saw d'Orbigny's specimens.

THE PRESENT MATERIAL

The French material. Because syntypes are not available and localities given by d'Orbigny are not of the accuracy required by modern collectors, only an examination of material from the same stratigraphic age in the vicinity of the type locality, present in the extensive collections of the British Museum (Natural History), London, could be undertaken.

Saint Dizier. The type locality of '*P.*' *cornueliana*. No placopsilinids were found, although brachiopod shells from this locality (in the care of C.H.C. Brunton), in particular, were carefully examined.

Le Mans (Sarthe). The type locality of '*P.*' *cenomana*. This material was more abundant, numerous molluscs having been collected by P.D. Taylor and J. Hammond in 1985 from Le Gasonfier 1 (Middle Cenomanian, Sables de Mans) [Locality No. 2] and 2 (Upper Cenomanian, Sables du Perche) [Locality No. 3]; also from the Lower Cenomanian *Mantelliceras saxbii*-*Hysterocheras orbigny* Zones, Sables et Grès de Lamnay (Iumachelle), Lamnay, Sarthe [Locality No. 1] for the study of bryozoa. Only a very small proportion of the shells carried adnate, agglutinating foraminifera and it is mostly on these specimens that the following work is based. Other specimens were found in the *Girvillella* shell bed, 3 m below proven Lower Cenomanian, in a roadside bank alongside route N831, D6, 200–300 m north of the church at St Mars, S. Ballon, Sarthe, France (W.J. Kennedy Collection).

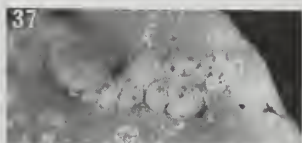
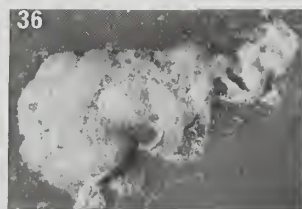
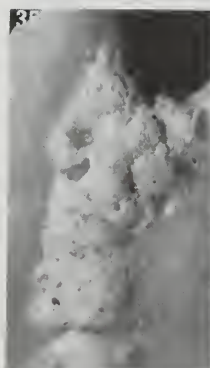
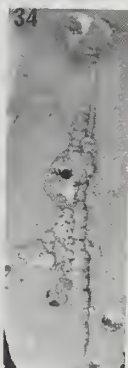
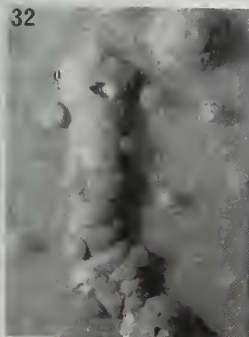
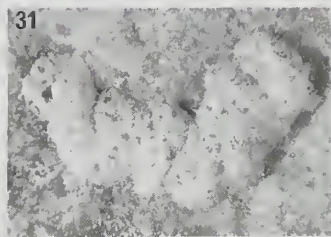
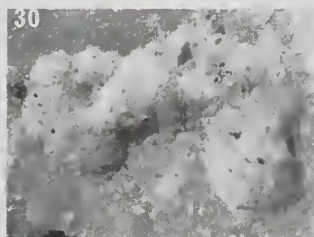
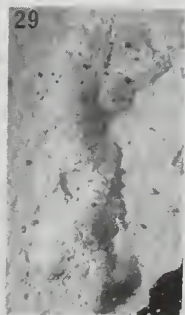
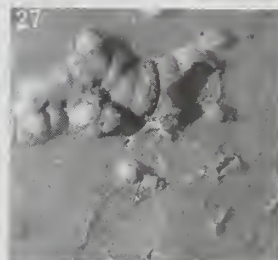
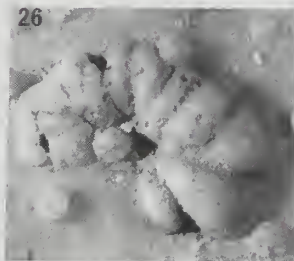
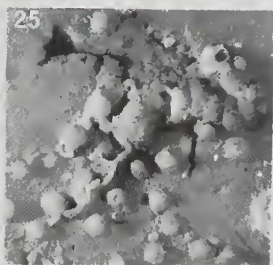
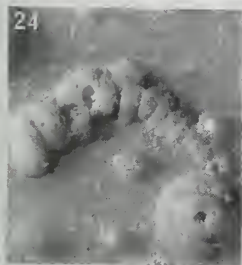
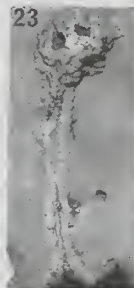
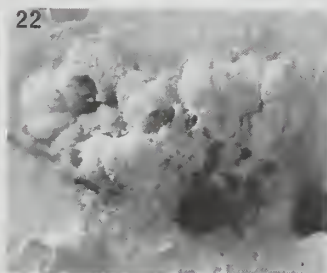
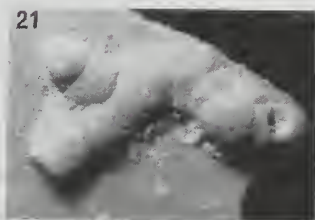
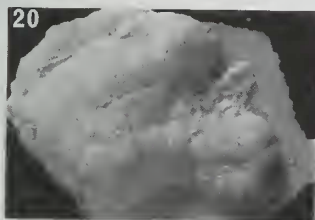
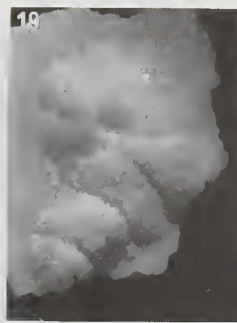
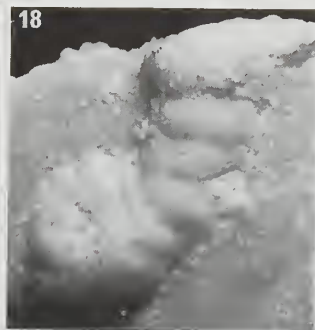
The English material. This was predominantly obtained from the A.W. Rowe Collection, from the Santonian *Micraster coranguinum* Zone at Northfleet [Locality No. 4] and Margate, Kent (P40805–25 and 40827–61), over 60 specimens being examined.

Additional specimens from the W.B. Carpenter Collection, housed in the Royal Albert Memorial Museum, Exeter (their Catalogue number 263/1903.816) were also studied. Specimens figured by Carpenter (1862: pl. 11, figs 11, 12 and 14) were recognized and are re-figured here as Figs 16, 20 and 21. It is unfortunate that none of these specimens is localized, being simply labelled 'Chalk'. Twelve attached specimens were measured; the remaining nine are unattached and ignored for this study. No apertures were observed, but the dimensions of the specimens tend to exceed the examples from the Rowe Collection.

Additional material in the BM(NH) collection, which has

- Figs 16–27, 32–34** '*Placopsilina northfleetensis* sp. nov. Figs 16–21 from the Chalk (of England); the register number of all (263/1903.816) is that of the Royal Albert Memorial Museum, Exeter. Figs 16, 20, 21 were drawn by Carpenter *et al.* (1862) and are re-illustrated here. Fig. 16 (Carpenter 1862: pl. 11, fig. 12), × 14. Fig. 17, magnification not known, fig. 18, × 25. Fig. 19, × 22. Fig. 20 (Carpenter 1862: pl. 11, fig. 14), × 11. Fig. 21 (Carpenter 1862: pl. 11, fig. 11), × 12. Figs 22–27, 32–34, loc. 4 (see p. 4). Fig. 22, P40809(1), overcrowding of specimens around pores in echinoid shell, × 5. Fig. 23, P40814, overcrowding has masked the true form of the specimens (note the long rectilinear portions in these forms as well as that illustrated on Fig. 34), × 5. Fig. 24, Paratype P40852(2) (see also Fig. 9), × 25. Fig. 25, P40835(4), specimen sculptured around the spine bosses of an echinoid (note the empty chambers and apparent lack of a basal wall), × 20. Fig. 26, P40835(2), × 30. Fig. 27, P40835(3), × 18. Fig. 32, **Holotype** P40852(1) (see also Figs 12, 14), × 20. Fig. 33, P40822, natural weathering has opened the rectilinear portion showing the empty chambers, × 10. Fig. 34, P40813 (see also Fig. 23), × 4.
- Figs 28–30, 35** '*Placopsilina cenomana* d'Orbigny. French specimens from the Le Mans area, Sarthe; for localities see p. 4. Fig. 28, P52779 (loc. 2), showing early truncatuline coil, × 30. Fig. 29, (loc. 2; this specimen lost during later development of the material), showing the crosier-like arrangement of earlier chambers (magnification unknown). Fig. 30, P52780 (loc. 3), initial coil followed by meandriform rectilinear chamber arrangement, × 22. Fig. 35, P52781 (loc. 1), specimen fitting closely to the contours of the shell on which it grew, × 18.
- Figs 31, 36–37** Examples of '*Placopsilina*' from the Lower Cretaceous of southern England which have incorporated large grains into their tests. Fig. 31, P38030 (loc. 5), × 15. Fig. 36, P38037 (loc. 5), × 13. Fig. 37, P37917 (loc. 6), curving around a shell this specimen cannot be shown in its entirety, × 5.

All light photographs.



been assigned to *cenomana*, is from the Aptian, Lower Greensand, Faringdon beds, Little Coxwell Pit at Faringdon, Berkshire [Locality No. 6] (A.G. Davis Collection); and Lower Greensand sponge gravel, yellow gravel beds, Windmill pit at Faringdon [Locality No. 5] (T.F. Grimsdale collection). Also from the Albian, Gault of Zone XI, at Folkestone (Chapman Collection); the Red Chalk of Hunstanton (G.R. Vine Collection); and the Santonian *Uintacrinus socialis* Band at Margate and possible specimens from the Campanian *Belemnitella mucronata* Zone (both A.W. Rowe Collection). These additional examples are not discussed in detail here since they will form part of a general review of agglutinating, adnate forms under preparation by others. They are mentioned here to illustrate that the 'genus' was present in the area now represented by southern England from Aptian to Campanian times.

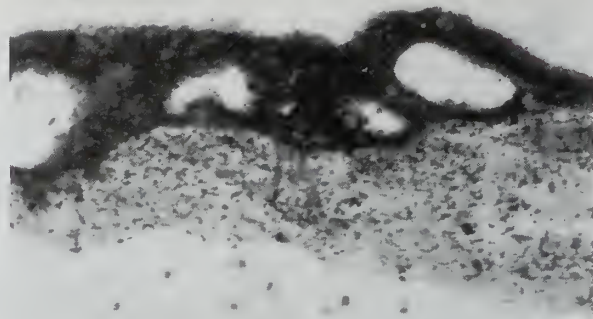
Although comparison between typical English and French specimens is relatively easy, there are many English forms from the Chalk which have lost symmetry, intergrown and developed long rectilinear portions (Figs 23, 34). One English specimen from the Aptian at the Windmill Pit, Berkshire (P38038) is very large (8.6 mm long with large included grains). The configurations of the test, as illustrated in my figures, is one of great irregularity, and it is noteworthy that the majority of English specimens, especially those from the Chalk, are composed of very fine-grained material.

NEW INFORMATION ON FRENCH AND ENGLISH MATERIAL

Dimensions

FRENCH specimens		ENGLISH specimens
11	Number of specimens measured	20
3-7+	Number of chambers in coil	5-8+
2-7	Number of rectilinear chambers	8-13
0.9-2.90 mm	Length of test	1.85-2.90 mm
0.5-0.95 mm	Coil width	0.15-0.48 mm
0.05-1.4 mm	Coil length	up to 1 mm
0.3-1.0 mm	Width of rectilinear portion	0.45-0.9 mm
0.15-0.35 mm	Chamber height rectilinear portion	0.2-0.40 mm

Wall structure. This was examined in both the French and English material by scanning electron microscopy of fractured surfaces and by routine sectioning and light microscopy. A basal wall was seen in all sectioned pieces, but whether it persists throughout growth of the rectilinear portion is uncertain (Fig. 25). In a thin section of a single English specimen (P52782, Fig. 38) there appeared to be projections from the basal wall beneath the coil into the echinoid shell on which it lived, which could constitute some form of attachment for the newly settled specimen. Further study revealed differences in the wall composition and arrangement. Because relatively few specimens were available from Le Mans my investigations are not as complete as I would have liked. Nevertheless it is apparent that the wall of the French specimens appears to be irregularly constructed of large angular grains, cemented together (Fig. 6). Being adnate and surrounded by angular Precambrian debris (Juignet 1968) this would seem to be an obvious if not obligatory building material, whilst those from England have a wall composed of what appears to be calcitic microgranules cemented in a radially orientated pattern (Fig. 3) which has



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Fig. 38 '*Placopsilina*' *northfleetensis* sp. nov. Light photograph of a thin-sectioned specimen from loc. 4 (see p. 4), showing projections from the basal wall beneath the initial coil into the echinoid shell on which it grew; P52782, $\times 120$.

included much finer material derived from the Chalk sea. Coccoliths are in evidence, but it is possible that much of the wall was secreted by the animal. The radially orientated arrangement may be analogous to the canaliculi reported in the Haddoniidae (Chapman 1898), but in my opinion the wall of the English specimens is solid. Even if the size of the grains is environmentally controlled, the differences in their arrangement could be significant. These observations on the wall composition and arrangement cast doubt on the conspecificity of the French '*Placopsilina*' *cenomana* with the English specimens so named in our collections. For the moment, therefore, the English specimens are considered a new species (here named *northfleetensis*, opposite), until further evidence becomes available.

General Remarks. It is difficult to know which characters to choose when proposing a diagnosis of a new species or subspecies, especially since d'Orbigny's specimens of *cenomana* have not been examined recently. Both the French and English specimens have features in common: a basally attached crosier-shaped initial portion composed of simple, undivided chambers, followed by a basally attached rectilinear series of similar chambers which may use the substratum as a basal wall; the intercameral foramen is normally basal and terminal, lipped and semilunar in shape.

The difference between them lies in the composition of the test. It is being increasingly suggested that these differences in the formation of the wall are of importance taxonomically, even at suprageneric level; nevertheless our lack of knowledge, as summed up by Hemleben & Kaminski (1990), underlines the need for caution here. Perhaps these species are 'programmed' to construct a framework of secreted calcite, and if in the environment there are large grains, they are collected and the secreted calcite changes form to mortar in the gaps. On the other hand, in environments where less detritus is available the secreted calcite framework continues to build, while the foraminifer collects what debris is available. If large grains are used, with plenty of secreted mortar specimens can grow to over 1 cm in size, it being easy for them to form chambers quickly, as demonstrated by attached specimens in our collections of an unidentified agglutinated species (P38030, Fig. 31; P38037, Fig. 36), from the Aptian

Faringdon Sponge Gravels. The smaller the grains available, and the greater the amount of secreted calcite mortar needed to hold them together, possibly mean in turn a higher level of test building intensity and the production of a porous framework to lessen the secretory process. Thus specimens using some large grains do less work and require less scaffolding to build their tests than those living in environments surrounded by only fine clastic material. Chemical examination with dilute hydrochloric acid appears to show that the French specimens cement their particles with calcium carbonate, but in fossil material such as this it would be difficult to estimate the amount of organic 'glycoprotein' cement, even if it were preserved as silica.

The young specimen cannot choose the substrate on which to settle and it may come to rest on coarse lag deposits or on a conglomerate (Sturrock & Murray 1981). It must use its pseudopodial net to obtain food and grains for shell building. As a placopsilid is permanently attached and cannot browse, it must spread its net widely or somehow emplace itself in a depression on a living shell where food and moving particles would be most abundant. If attached to a shell, this would provide stability and, if the host animal was still alive, a means of mobility.

SYSTEMATIC DESCRIPTION

'*Placopsilina*' northfleetensis sp. nov.

Figs 3-4, 9, 11-12, 14, 16-27, 32-34

NAME. From Northfleet, Kent, England.

DIAGNOSIS. An initially coiled, later rectilinear, multichambered agglutinating test, composed of radially aligned calcitic granules.

HOLOTYPE. P40852(1), on an echinoid shell from the Santonian (*Micraster coranguinum* Zone), Northfleet, Kent, England (Figs 12, 14, 32). F.W. Rowe Collection. The paratype P40852(2) accompanies the holotype on the same piece of shell (Figs 9, 24).

OTHER SPECIMENS (on registered echinoid fragments): P40809, P40814, P40816, P40818, P40822, P40835.

DEPOSITORY. All material in Micropalaeontology (Foraminifera) Section, British Museum (Natural History), London.

DESCRIPTION (holotype). Test multichambered, agglutinating, attached throughout its entire length so that the attached surface is flat and the non-attached side convex. Chambers undivided and arranged in a linear manner, increasing regularly in height and width, the final chamber being the largest. There is a small, worn, initial coil (probably planispiral) followed by a crosier-like arrangement of chambers, later straightening into a final rectilinear portion of the test. Wall composed of calcitic microgranules cemented together and radially arranged.

Aperture: the last-formed chamber has been broken away, but the apertural imprint is terminal, basal against the substratum on which the animal was living. The intercameral aperture on the penultimate chamber is also basal, an arched slit across the central portion of the face, with an overhanging lip.

Dimensions: 19 chambers can be counted. Width of final

chamber 0.61 mm; height of final chamber 0.35 mm; width of intercameral aperture 0.15 mm; diameter of coil 0.19 mm; length and width of 'crosier' 0.35 mm and 0.45 mm, respectively.

REMARKS. In spite of its morphological diversity, one specimen is selected as holotype to represent the species, but only for stability of nomenclature. Even the paratype on the same fragment (P40852(2), Fig. 24) shows variation. The specimens illustrated (Figs 16-23, 25-27, 32-34, 38), and those mentioned on p. 4 under 'English material', are not paratypes, since they are not on the same piece of echinoid shell as the type. They show many, but not all, of the forms this taxon may assume, given that they were seldom subject to overcrowding on the echinoid shells on which they are often found. As a result, many English specimens have lost symmetry, intergrown and developed long rectilinear portions, and it is not possible, in the majority of these cases, to recognize individuals. The wall structure, as revealed by scanning electron microscopy of fractured surfaces, is of calcitic microgranules cemented predominantly in radial, interconnecting rows. Without sectioning Carpenter's specimens (Figs 16-21) there is no certainty that they are conspecific, but it is assumed that they are.

A basal wall is present in all sectioned pieces of specimen, but may be absent in the later rectilinear portion. The dimensions of all measured English specimens are given earlier (p. 4) for comparison with my French material, thought to be '*Placopsilina*' *cenomana*, *sensu stricto*, from which *northfleetensis* differs in having a somewhat ordered arrangement of agglutinating material in the wall.

Examination of *Haddonia* Chapman (1898), the only other genus to which these specimens could, at present, be assigned, reveals that the wall contains coarse pores and the intercameral aperture is more an areal median slit with a tooth-like projection.

CONCLUSION

This investigation has revealed that Cushman (1920) was in error in designating *cenomana* as type of *Placopsilina*, because *P. scorpionis* d'Orbigny (1850a) was already type species by monotypy. Until a neotype is chosen for the little-known *scorpionis*, a task beyond the scope of the present paper, all other species referred by d'Orbigny (1850b, 1852) to *Placopsilina* should be cited in inverted commas. Should *scorpionis* prove to be the sole true representative of the genus *Placopsilina*, a reappraisal of all generic placements would have to be undertaken.

Initially I set out to answer two questions: first, can the English specimens in the British Museum (Natural History), identified as *Placopsilina* or *Lituola cenomana*, be equated with those of d'Orbigny? This question cannot be truthfully answered as I have not been able to locate d'Orbigny's type material, but it is unlikely now, with most major collections properly curated, that they will ever be discovered. If, however, the comparison is made using material collected in or near the type locality, and which can be interpreted as falling within the concept of d'Orbigny's species *cenomana*, then the latter is externally very similar to the English Santonian (*M. coranguinum* Zone) specimens from Rowe's collection and others mentioned above, at least superficially.

However, when the walls of English specimens revealed by fracture are examined under the scanning electron microscope, they are seen to differ significantly in structure and agglutination. For this reason the English specimens are here described as a new species. Since adnate, agglutinating species are at present under critical investigation by others (M. Simmons, personal communication), it is not considered appropriate here either to place them in a new genus or to include them within *Haddonia*, whose type species, the Recent *H. torresiensis* Chapman (1898, holotype BMNH no. 1897.11.20.1), has a very coarsely perforate wall and a different aperture.

The second question was, are *cenomana* and *cornueliana* synonymous? Even though *cornueliana* is from stratigraphically older beds there is no reason, at present, to suspect that it is any different from *cenomana*. D'Orbigny was a creationist: Heron-Allen (1917: 17) translates him as believing that, should he find 'in Nature forms, which after the most scrupulous analysis, present no appreciable difference, though they are separated by an interval of a few strata . . . I should not hesitate for an instant in regarding them as distinct'. Should the types of *P. cornueliana* ultimately be found in the Saint Dizier Museum or elsewhere (see p. 2), then that would be the time to make a formal statement on the synonymy (or otherwise) of the two species.

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